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THE OUTLOOK FOR CONSERVING THE BAND-TAILED PIGEON AS A GAME BIRD OF CALIFORNIA

By JOSEPH GRINNELL

WITH ONE MAP

(Contribution from the Museum of Vertebrate Zoology of the University of California)

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INTRODUCTION

Up to the present time, the Band-tailed Pigeon has been taken practically no account of in the game laws of California. This may have been due to two things: to its lesser importance as a game bird, as compared with quail and ducks for which California is justly famed, and to its appearance sporadically in large numbers, which has given the impression that it was in no danger of depletion.

The unusual slaughter of pigeons in the southern coast counties in the late winter of 1911-12 (see Chambers, 1912, p. 108) has brought forcibly to the attention of ornithologists, the possibility of the extermination of our western wild pigeon. We would certainly be forever blamed if we took no steps to prevent a repetition of the deplorably thoughtless treatment which was given the now extinct Passenger Pigeon of the eastern states.

For the purpose of ascertaining the facts in regard to the standing of the Band-tailed Pigeon, and with a view of offering appropriate recommendations at the coming legislature, the writer was asked by the Secretary of the State Fish and Game Commission to compile all data obtainable in regard to the Band-tailed Pigeon, both as it exists now, and as it has occurred in the past.

This work was undertaken at the Museum of Vertebrate Zoology, with the assistance of Miss Margaret W. Wythe, and the results are presented in the following pages. Correspondence with many students of birds throughout the state produced surprisingly little definite information, and the literature of western ornithology proved scarcely more resourceful. We have, of course, exercised discrimination in getting at the real facts, as contrasted with general and hearsay statements.

It is believed that enough evidence is here given to demonstrate beyond any doubt the urgent necessity of the immediate passage of laws giving protection to the Band-tailed Pigeon. Otherwise the bird is plainly doomed to take its place in the growing list of North American animals which have totally disappeared as a result of man's misuse of natural resources.

GENERAL DISTRIBUTION OF THE BAND-TAILED PIGEON

There has been more or less confusion in the popular mind as to the distinctness of the Passenger Pigeon from the Band-tailed Pigeon. Both have been called Wild Pigeon. The two species, however, are very different, and as far as known the ranges of the two nowhere overlapped. The Passenger Pigeon (*Ectopistes migratorius*) was restricted to the region east of the east base of the Rocky Mountains; the Band-tailed Pigeon (*Columba fasciata*) ranges from, and including, the Rocky Mountains westward to the Pacific Coast, though not of course continuously over the intervening desert areas.

Recorded localities of occurrence of the Band-tailed Pigeon extend as far east as Boulder County, Colorado, and western Texas, south into Mexico, and north to Vancouver Island and the adjacent mainland of British Columbia. Relatively few of these localities, however, are breeding places; many are of sporadic occurrences. So that the area outlined must not for a moment be thought of as supporting a pigeon population throughout its extent, either continuously or regularly.

In a general way it may be said that at the north and at high altitudes the species is only a summer visitant. To be more explicit, the Band-tailed Pigeon summers in the Transition life zone, whether this be in the northern part of its range or at the south. In the latter case the high altitudes of the mountain ranges resorted to, result in the same temperature conditions as at lower levels to the northward.

In winter the pigeon migrates to more southerly latitudes, or to lower altitudes, as the conditions make it necessary in order to reach a bearable winter climate. Although recorded south along the Mexican Plateau, it is believed that practically all the birds breeding to the north of the Mexican boundary winter within the United States, concentrating at that season in the extreme southwest.

From the data at hand pertaining to distribution, it seems probable that the pigeons of the Rocky Mountain region do not cross in migration to the Pacific slope, but winter with the locally bred contingent in suitable places near the Mexican line, in Arizona and New Mexico. In parallel fashion those pigeons appearing in the valleys of California in winter come from the mountains adjacent and from the Pacific Coast district to the north, in Oregon, Washington and British Columbia.

LOCAL DISTRIBUTION

The following facts bear upon the question of the source of at least part of the pigeons wintering in the valleys of California. The species occurs at Blaine, Washington (near the British Columbia boundary), from May 5 to September 15 (Dawson, 1909, p. 555); in southern Washington west of the Cascades it is present from May 15 to September (Coues, 1874, p. 386); and at the mouth of the Columbia River it is present from May to October (Bendire, 1892, p. 122). In Washington County, Oregon, it is common in summer (Anthony, in Bendire, 1892, p. 123); at Dayton, Yamhill County, Oregon, the pigeon arrives April 20 and leaves the last of November (Hadley, in Woodcock, 1902, p. 28); at Corvallis, Benton County, Oregon, it occurs from the first of April until the last of September (Woodcock, 1902, p. 28).

From the above data it will be seen that north of the northern boundary of California the Band-tailed Pigeon is wholly migratory. It seems inevitable that this northern bred contingent moves south *into California* for the winter season. In other words the entire pigeon population of the Pacific Coast region concen-

trates in winter in west-central and southern California. It becomes apparent, therefore, that as far as the whole Pacific Coast region is concerned, California alone is in winter responsible for the existence of the species.

The accompanying map (fig. 7) serves to show both the summer and winter distribution of the Band-tailed Pigeon within the state. Because of the small scale, record stations for the two seasons in some cases appear to be almost or quite coincident. But the rule may be laid down without hesitation, that this bird

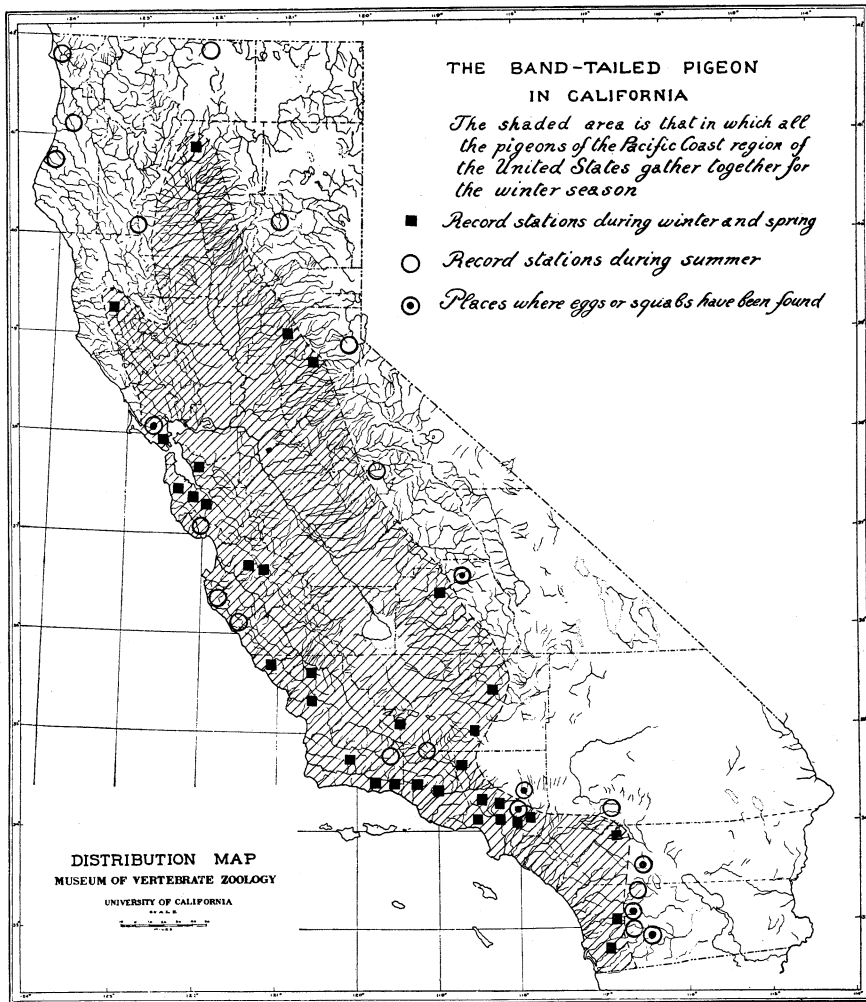


Fig. 7

summers in the Transition zone and winters in the Upper Sonoran. Within our State there is thus a vertical migration coupled with a winter influx of birds summing to the north.

There is nothing to show that the individuals nesting locally on the mountains, and the northern migrants, flock separately, though this is possible. Neither is there any evidence to show that birds hatched in a particular mountain range always return to the same vicinity the following year, this being the case with some kinds of birds. On the contrary, our data does show, as far as it goes, that

local breeding places at least may not be fixed from year to year. There is considerable shifting, this irregularity being concurrent with varying food supply.

To illustrate: in case there has been in a certain mountain range an abundant acorn crop, sufficient to last throughout the winter, any flock of pigeons foraging there would be likely to linger on until the advent of the usual season of nesting. These pigeons would thus be more likely to remain there and breed that particular season, zonal conditions being favorable, than to move off to another mountain range. Such an explanation would appear to account for the vacillating numbers of breeding birds in the various more or less isolated mountain ranges of southern California.

RELATIVE NUMBERS, PAST AND PRESENT

It has been found practically impossible to estimate relative numbers of pigeons now as compared with any former period. This difficulty results from the variability from year to year in the degree of concentration of the birds in limited areas, and further from the sporadic distribution at any season. Reports of observers, therefore, no matter how explicit they may appear, cannot be used fairly in such inductions.

In fact, no single statement previous to that of Chambers (1912, p. 108) would lead to the inference that pigeons were ever more numerous than last year. But taking the above considerations into account, no significance can be given to such isolated statements. The literature examined gives no exact data; but we can, nevertheless, be morally certain that there has been a very great decrease in the numbers of pigeons since the early days of western settlement, when game of all sorts was so abundant as to arouse but little comment.

FOOD OF THE PIGEON

As already intimated, the amount of food available to the pigeon appears to be the main controlling factor in distribution, aside from zonal considerations. This is more particularly true in winter, though probably to some extent in summer also. As will be observed from the following data, the food consists chiefly of berries and nuts, of intermittent productiveness. A large crop one year in a certain region is almost sure to be followed by a barren year. So that the pigeons would fare poorly if dependent closely on any one single locality. Their proclivity for circulating over large areas makes available to them the abundant crops recurring at different places. The birds in great numbers are thus able to find support somewhere all the time.

Out of twenty-two records, ten give acorns as the chief article of diet. Probably all the species of oaks are patronized by the pigeons. Those especially recorded are: in west-central and southern California, the live oaks (*Quercus agrifolia* and *Q. wislizenii*), in the foothill regions, the golden oak (*Quercus chrysolepis*), and along the Sierra Nevada and on the San Bernardino and San Jacinto mountains, the black oak (*Quercus kelloggii*). The acorn season lasts well through the autumn months, and under favorable circumstances even until February.

As with all other food, the acorns are swallowed whole in such numbers that the crop becomes at feeding time enormously distended. In this dilation of the gullet the food is acted upon by the powerful digestive juices, and both shell and kernel rapidly disintegrate and pass on to the stomach and gizzard. There is no disgorgement of hard parts of the food, as with some birds. Considering the apparent small size of a pigeon's mouth, an amazing thing is its ability to swallow

whole such relatively huge objects as the acorns of the golden oak, in particular.

In the coast region of central California the berries of the madrone (*Arbutus menziesi*) form an attractive food source in the fall of the year. In certain instances bands of pigeons have been known to stay around tracts of madrones until practically every berry had been taken. Sometimes the birds feed so largely on these berries that the flesh becomes discolored thereby (Jenkins, 1906, p. 126).

The berries of certain species of manzanita (*Arctostaphylos*) are resorted to when acorns fail. The little apple-like fruits are eaten both green and ripe, becoming available in July as about the earliest crop. At times in midwinter, October to February, the pigeons fall back on the abundant fruit of the Christmas-berry or California holly (*Heteromeles arbutifolia*), and more rarely upon the fruit of the coffee berry (*Rhamnus californicus*). The latter bears almost perennially.

There is a period of the year when fruit and nut crops have almost vanished. The flower and leaf buds of certain plants are then eaten in quantity. In February manzanita buds have been appropriated by the pigeons in the Sierran foothills (Dean, 1904, p. 111). In March and April the pigeons have been repeatedly observed to feed upon oak buds in the interior valleys of both west-central and southern California. One observer describes a bitter taste noticeable in the flesh of pigeons, thought to have been due to this diet of oak buds (Bendire, 1892, p. 123).

In southern California the sycamore balls are frequently eaten in early spring. No less than thirty-five of these ball-like flower clusters have been counted in the crop of a single pigeon (Evermann, 1886, p. 93). Various small plant seeds have also been reported as found in crops of pigeons.

Finally, in two instances, pine seeds have been found in the birds' crops: in Calaveras County in July (Belding, 1890, p. 21); and on Mount Pinos, Ventura County, June 29 (Grinnell, 1905, p. 382). It is, of course, probable in these cases that either the cones were fully ripe and the scales spread so that the seeds could be readily extracted, or that the seeds were picked up from the ground beneath the trees where they had fallen.

All of the above articles of diet include only wild fruits, such as are of indifferent value to man. At times, however, pigeons have been found to resort extensively to grain fields. In many cases the birds have repaired to stubble fields where they gleaned the waste grain, wholly worthless of course. Thus near Three Rivers, Tulare County, in July, 1891, pigeons were foraging in barley stubble (Fisher, 1893, p. 31). Then again, in a few instances, newly sown grain has been resorted to, with the result that more or less damage has been inflicted—the only way known in which the Band-tailed Pigeon affects man's interests unfavorably. At Palo Alto in January, 1901, good sized flocks were observed on newly sown barley fields. The crop of one bird was crammed with seed barley (Grinnell, MS). At Santa Monica, in February and March, 1901, flocks were feeding in grain fields. Their depredations were complained of by a rancher who had put out poison for them. Eight of the birds thus killed were examined (Swarth, MS).

"In March, 1901, great flocks of the pigeons poured into San Geronio Pass and fed in the barley fields. For about two weeks there were hundreds of them. * * * Their method of feeding was peculiar. Instead of spreading out they kept together, alternately walking and flying. Those behind would fly a few feet ahead of the advance line, alight, and walk along picking up grain until other rear ones would fly ahead and it came their turn again. In this way the flock

advanced, some in the air all the time, and ground was covered quite rapidly. The crop of a specimen secured * * * contained 615 grains of barley by actual count" (Gilman, 1903, p. 134).

The relative paucity of records of definite damage to grain leads to the conclusion that the amount of actual loss inflicted by pigeons is very small. For, if it regularly reached appreciable proportions, we would hear far more frequent complaints. The irregularity in distribution from year to year serves to mitigate such an adverse bearing of the pigeon. Only at long intervals are the birds likely to visit a given locality in just the appropriate season to have any effect on the grain interests.

NESTING HABITS

Our Band-tailed Pigeon, unlike the Passenger Pigeon which once abounded in the northeastern states, does not nest in close colonies. Records show that with our bird, even where in summer numerous, the nests are widely scattered through a given tract of woods. An extreme case is reported from Arizona where, in the Huachuca Mountains, a community of about thirty-five pairs nested in a "scattered rookery, probably not averaging a nest to every three or four acres at the most thickly populated part" (Fowler, 1903, p. 69).

We find in literature a number of general statements to the effect that Band-tailed Pigeons "nest in small colonies". But in no case is there any detailed account of such nestings; and it may well be that these are general impressions or hearsay notions. It is true that all through the breeding season pigeons are seen in flight from place to place in small companies. It is possible that the component individuals belong to nesting pairs and convene in flocks when foraging, but isolate themselves when visiting their nests. This evident trait is probably responsible for the notion above referred to, that the birds nest in colonies. In the writer's experience in California, difficulty enough has been found in locating even one nest, and this when the birds were almost constantly in sight. The point is plain—that this species is not to be considered notably more sociable during the nesting season than the Mourning Dove. The pigeons scatter out at nesting time over large extents of suitable country.

Nesting places chosen vary considerably. According to Bendire (1892, p. 123), nests have been found, in Oregon, on the ground between two tree roots, upon an old stump eight feet from the ground, another in the top of a fir about 180 feet from the ground. In Washington, eggs are "often laid upon the bare ground of an oak grove, hop-field, or clearing, without pretense of nest". Usually, however, they are placed in fir saplings "at a height of ten or twenty feet, resting against the stem of the tree or upon a horizontal branch" (Dawson, 1909, p. 555).

Here in California, we have only hearsay statements to the effect that pigeons nest on the ground. Definite accounts of such a habit are lacking. Specifically described nesting sites are characterized by such remarkable uniformity in location that we are safe in concluding that the birds ordinarily select horizontal limbs of trees upon which to place their nests. Height above the ground varies in the described cases from 8 to 29 feet.

Nest trees, where named, have been black oak and golden oak, and these trees have stood in open mountain forests on canyon sides or steep slopes otherwise. In one case (Mailliard, MS) the nest was built upon the overhanging branch of a lilac, but this grew upon a rather open steep slope. It would appear that the birds select such a site as will allow of their taking direct and therefore rapid flight from and to the nest.

In structure the nests are mere platforms of coarse twigs. One now in the Museum of Vertebrate Zoology was obtained at Fuller's Mill, in the San Jacinto Mountains, at about 5900 feet altitude. The nest rested on a large limb of a black oak, about five feet from the main trunk, and was partly supported on one side by a small dead limb. The nest is a frail structure, made mostly of dead twigs from pine and oak trees. These twigs are laid crosswise so that there is a great amount of interstitial space. The diameter of the mass is about 220 millimeters ($8\frac{3}{4}$ inches), though several straggling twigs extend far beyond this limit: the depth is about 100 millimeters (4 inches). The single egg rested at one side of the center of this rude platform. As remarked by Gilman (1903, p. 134) of two nests found by him in the San Jacinto Mountains at 6500 feet altitude, it is a marvel how the egg can be kept warm enough to hatch, resting on such an airy structure at that cool altitude.

It is believed that both birds take part in incubation. Bendire (1892, p. 127) states the period of incubation to be from 18 to 20 days. He states further that the young leave the nest about one month after hatching. If we allow one week for the selection of nesting site and construction of nest, a total of very close to two months is thus devoted to a single rearing.

RATE OF INCREASE

In our present study, in which we are seeking for facts upon which to base recommendations relative to the proper treatment of the Band-tailed Pigeon so as to make it of greatest value to the sportman's interests, perhaps the most important thing to determine is the rate of reproduction of the bird.

Unfortunately the published information in regard to the number of eggs laid or young reared consists largely of general statements. At the north, in Oregon and Washington, there is no doubt but that two eggs not infrequently compose one setting. We have definite information that in the Willamette Valley three nests were found each of which contained two eggs (Bendire, 1892, p. 123). On the other hand, Dawson (1909, p. 553) says explicitly: eggs usually one, sometimes two. Another report, from Beaverton, Oregon, gives one as the complement (Woodcock, 1902, p. 28). In Arizona, all reports agree that but a single egg is laid. Three specific cases are on record of one egg being found in each nest. This is true also of Colorado.

In California we have heard frequent reports to the effect that two eggs are commonly laid. As shown from the accompanying table, so far as definite accounts are available, but a single egg was the full nest complement in all cases but one. If two eggs are laid it can thus only be in exceptional instances, so rare as to be ignored in deductions concerning rate of increase. The occasional extra egg might well be considered as offset by desertions of nests, or disasters from other causes. In no case has more than one squab been found in a nest, though the data is confessedly limited.

The egg-laying season of the pigeon is restricted at all latitudes to the summer months. This, as shown on previous pages, is probably correlated with the fact that the bird repairs to the Transition life zone for the breeding season, which, whether at sea level in the north or on mountain ranges at the south, presents inhospitable climatic conditions at other seasons. In fact, the birds themselves undergo an annual migration, latitudinal at the north, vertical at the south.

In the state of Washington, according to Dawson (1909, p. 555) the pigeons arrive at the latitude of the Columbia River in April and depart in October or November; they arrive at Blaine, near the British boundary, the first week in May

and are gone by the last of September. The same author thinks it possible that two broods might be reared in southern Washington but only one farther north; and he gives the nesting time as May to July. These months include all the specific dates given for the region north of California.

In the mountains of Arizona, nests with eggs have been reported with apparent authenticity from March 6 to September 25 (Bendire, 1892, p. 123). This indicates a protracted breeding season, though the extreme dates are probably quite exceptional. It does not follow either that the same pair of birds rears two or more broods the same year. That not all the birds nest in a given locality at the same time is attested by Fowler (CONDOR, 1893, p. 69.)

The accompanying table shows all the actual dates of nesting known to the writer within the state of California. Extremes are May 3 and July 30, the first for a fresh egg, the latter for an egg nearly ready to hatch. The mean date for

TABLE GIVING DATA IN REGARD TO THE NESTING OF THE BAND-TAILED PIGEON IN CALIFORNIA

Place	Date	Contents of Nest	Authority
Pine Mt., 3250 ft., San Diego Co.	May 3, 1901	2 eggs (fresh)	Sharp (1902, p. 16)
Pine Mt., 3250 ft., San Diego Co.	May 11, 1901	1 egg (incubation well advanced)	Sharp (1902, p. 16)
San Jacinto Mts. at 6500 ft., Riverside Co.	May 14, 1897	1 squab (just hatched)	Gilman (1903, p. 134)
San Jacinto Mts. at 6500 ft., Riverside Co.	May 14, 1897	1 squab (half-grown)	Gilman (1903, p. 134)
Mt. Wilson, 5500 ft., Los Angeles Co.	May 23, 1897	1 squab (about one week old)	Grinnell (1898, p. 20)
Cuyamaca Mts., 4 miles from Julian, San Diego Co.	June 4, 1896	adult bird on nest, but not flushed.	Albert M. Ingersoll (in letter)
Pine Mt., 3250 ft., San Diego Co.	June 24, 1901	1 egg (incub. adv.; same nest as May 11, 1901)	Sharp (1902, p. 16)
San Jacinto Mts. at Fuller's Mill, 5900 ft., Riverside Co.	July 1, 1908	1 egg (incubation slight)	Museum Vert. Zool.
Mt. Wilson, 5500 ft., Los Angeles Co.	July 5, 1894	1 egg (considerably incubated)	Grinnell (1898, p. 20)
Lagunitas, Marin Co.	July 30, 1912	1 egg (incubation far advanced)	Joseph Mailliard (in letter)
Barley Flats, 5600 ft., Los Angeles Co.	last of July, 1888	1 young (able to fly)	Antonin Jay (in letter)
Barley Flats, 5600 ft., Los Angeles Co.	last of July, 1888	1 young (able to fly)	Antonin Jay (in letter)

eggs in the nest is June 16. A remarkably brief nesting season is thus indicated as regards our immediate region, and the same evidently holds with our winter visiting birds from the northwest coast.

The general statement is prevalent in works on western ornithology that two or more broods are reared by the Band-tailed Pigeon each year. A close examination of all the definite evidence submitted makes such a state of affairs, however, improbable. The notion seems to have originated with the report (probably an intentional prevarication on the part of an unprincipled collector and dealer in birds' eggs) that the Band-tailed Pigeon bred in southern Arizona "nearly every month in the year, and several broods must be reared by each pair during the season". The observations made by Swarth (1904, p. 5) and Fowler (1903, p. 69) in the same region do not support the above statement.

Considering the time necessary to rear a brood—as already shown, close to two months—and the extreme dates between which eggs or young have been

found in nests, it seems impossible that, at least as far as our knowledge of the species on the Pacific Coast is concerned, more than one brood can be raised each year by a single pair of birds. It is probable that, should the nest be robbed, a second egg will be laid the same season. And this might account for some of the later nestings. We have record of such occurrence (Sharp, 1902, p. 16): On Pine Mountain, San Diego County, May 11, 1901, a bird was flushed from its nest containing one egg, incubation advanced; this was taken, and on June 24 of the same season a second egg nearly ready to hatch was found in the same nest.

The question is pertinent as to whether or not pigeons breed the first year, that is, when they are a year old. We have no facts to offer in this regard, save that domestic pigeons nest the first year. Although Band-tailed Pigeons are to be seen in small companies all through the nesting season, it is just as likely that the constituent birds belong to nesting pairs, congregated for foraging, as that they are non-breeders. The writer's opinion is that the wild pigeon breeds the first year.

From the above facts the startling conclusion is to be drawn that the rate of increase of the Band-tailed Pigeon is slower than that of any other game bird in America! If successful, each pair of pigeons rears one young per year.

Each pair of Valley Quail rears on an average ten young per year (see Bryant, 1912, p. 138). It is to be inferred that under primitive conditions the Band-tailed Pigeon was ten times as immune from fatalities due to predaceous animals and other causes aside from senescence as is the quail. For a biological axiom postulates that the birth rate in a species has become adjusted to meet the maximum death rate to which that species is liable under normal circumstances.

ENEMIES OF THE PIGEON

Our enquiry has failed to bring to light a single case where a pigeon has met death through other than human agency. The Cooper Hawk is in every hunter's experience known to prey regularly upon quail, levying a very heavy tax the year through. But no one has reported molestation of pigeons by this or any other hawk.

One may infer something as to the natural enemies of an animal from its behavior. Pigeons fly in the open; when not foraging they roost on the most prominent dead-topped tree in the neighborhood, where they perch conspicuously outlined against the sky whether the observer be posted directly beneath or on the adjacent hillside. They appear to be unaware of any possibility of attack from a winged enemy. The only one to be expected is the Duck Hawk, in coastal regions where this falcon occurs; for tame pigeons have been known to be pursued and captured by it. But, as stated above, we know of not one definite case of even the annoyance of the wild pigeon by any species of hawk. Its size and heavy coat of feathers doubtless makes the pigeon a less desirable quarry than many other game birds.

When foraging on open ground, pigeons show little trepidation, save as closely approached by the hunter, who has educated the birds by repeated shooting at the flocks. In the foliage of trees or bushes the birds are likely to remain perfectly quiet upon the approach of man or beast. They thus often elude observation altogether. If routed out by too close approach, they leave their perch abruptly with a disconcerting clapping of the wings, and with velocity acquired with surprising quickness are almost instantly far beyond reach of the bob-cat's spring or even the shot-gun's charge.

To recapitulate, the Band-tailed Pigeon is extraordinarily immune from na-

tural dangers, and its remarkably slow rate of increase was doubtless great enough to easily maintain its numbers under the conditions obtaining *before* the appearance of the white man and his firearms.

FACTORS FAVORING THE PERSISTENCE OF THE PIGEON

As we reflect upon the above facts of slow increase and gregarious habits our only marvel is that the pigeon has been able to maintain its existence at all in face of the fifty years or more of hunting to which it has been subjected without restraint. The factors which have allowed the persistence of the bird against this new and adverse condition are probably included among the following.

(1) The birds repair to forested areas for the breeding season. These are mostly in rough, mountainous country, sparsely settled by man. It is likely, further, that owing to the forest reserve system, of more and more recognized value as a governmental institution, these summer retreats will never be wholly destroyed through clearing or settlement.

(2) The pigeon does not nest in colonies, but the individual pairs scatter out through the woods.

(3) The pigeon is secretive in its nesting habits, so that the nests are not subject to molestation by marauding humans or beasts. "Their nests are mere platforms and hard to see; owing to the surrounding foliage, they are not readily discovered except by the actual flushing of the bird. One must be quick even to see the bird. It does not flutter along the ground in the manner of the Mourning Dove, nor does it sit on a nearby branch and coo, but is off like a shot; and it requires a pretty sharp eye to follow its flight through the trees" (Sharp, 1902, p. 16).

(4) In winter, although the pigeons gather in large flocks and concentrate in limited districts, they are irregularly distributed from year to year. That is, although they may be hunted to the verge of annihilation in a restricted area one season, the residue is not likely to return to the same locality the following year, and so be subjected to a repetition of the catastrophe. The nature of the food and the fact that this is of variable supply, leads to the wintering of pigeons in recurring seasons in rough mountain country where they are largely out of reach of hunters, thus giving the birds frequent respite.

(5) Several writers and observers, even as far back as Cooper (1870, p. 507), comment upon the quickness with which the pigeons become wary when shot at. They learn suspicion of hunters; "their shyness is probably due to the fact that in their passage from the north they are compelled to run the gauntlet of hundreds of gunners" (Henshaw, 1876, p. 265).

And here is one benefit which accrues from the flocking habit: individual safety is attained through community watchfulness. This may be considered as in part counter-balancing the possibility of pot-shooting numbers of the birds at one time because of their being massed in a flock. The gregarious habit brings to the hunted bird both benefit and danger; but with the increased deadliness of firearms, the constantly augmented numbers of hunters, and the ever greater facilities for quickly reaching a locality where pigeons are known to have appeared, it would seem that the flocking habit brings disproportionately greater danger to the birds, as time goes on.

THE DESTRUCTION IN 1912

Judging from recorded accounts, it is only at rare intervals that such a

slaughter has taken place as that noted in the southern coast counties of this state in the winter of 1911-12 (Chambers, 1912, p. 108). Indeed, as suggested by the writer cited, such unmitigated destruction could not last long without complete extinction as a result. In substance Chambers' account is as follows:

"Band-tailed Pigeons were abundant the past winter from Paso Robles south to Nordhoff all through the coast range of mountains. One hunter from Los Olivos shipped over 2,000 birds to the San Francisco and Los Angeles hotels. The morning train from San Luis Obispo to Los Olivos on Sundays averaged 100 passengers who came to hunt pigeons. A prominent hunter stated that these passengers averaged about thirty birds apiece per day. That would make this one day's excursion account for over 3,000 pigeons. Now—this is only one train and one day's hunting! One can hardly calculate the number of birds killed by hunters in automobiles, and by those who started from Los Angeles, San Francisco, Santa Barbara, Ventura, Santa Maria, Paso Robles, Lompoc, and other smaller towns.

"The writer, who is in the gun and ammunition business, was thoroughly disgusted with the game hogs who simply shot pigeons for the sport (?) and could not even eat them all. It is a shame that something is not done for these beautiful birds, which are doomed to follow in the footsteps of the Passenger Pigeon. I honestly believe that the people will never again see such a flight of Band-tailed Pigeons. In Nordhoff it is the largest they have ever seen, and the birds evidently hung around until they were simply shot out. This same state of affairs is probably true in other localities.

"If something is not done very quickly these birds are doomed; for any bird that flies in such flocks is bound to be exterminated. What can be done?"

It is probable that an unusual concentration of the pigeons from the whole Pacific Coast region into a district easily reached by hunters gave exceptional opportunity for the infliction of the slaughter above recounted. The weak place in the pigeon's defense thus comes when conditions of restricted food supply force it into localities where its survival depends upon whether or not hunting is sanely regulated. Obviously, suitable legislation must be enacted at once, before chance of a repetition, even in lesser degree, is afforded.

THE VALUE OF THE PIGEON TO MAN

A bird in its relation to man may be considered in four different bearings.

(a) No matter what the degree of value of an animal to man's interests (and it may, on the whole, be even of extreme detriment), to allow complete extermination is out of harmony with an enlightened consideration of the future. Our successors will not approve of our thoughtlessness in completely destroying the grizzly bear! No matter if the Band-tailed Pigeon had no value, or was even noxious economically, this is no reason why the life of the *species* should be jeopardized.

(b) Very many of our birds are of pleasing plume, cheerful manner, and attractive song, thus bringing an active appreciation on the part of the majority of mankind. In this role birds at large have a marked esthetic value. The Band-tailed Pigeon is admittedly of very little or no attractiveness on this score. Its voice is not at all pleasing, as is that of the Mourning Dove, and its reclusive habits bring it rarely to the notice of any except the hunter.

(c) The economic value of many birds is positive. They perform distinct service in destroying injurious insects or seeds. Other birds are decidedly the reverse, because of their ravages on crops. As shown on previous pages of this

paper, the Band-tailed Pigeon is practically indifferent in its bearing upon agricultural interests. The bird feeds upon native fruits and nuts of no value to man. At times it forages over stubble fields for waste grain. In rare cases newly sown grain fields have been raided to an extent to amount to definite damage. We are safe in saying that the pigeon has no beneficial bearing upon agriculture; it is at least indifferent.

(d) Game animals form an important asset of the state, because they are of direct use to man as food, because their pursuit leads to pleasurable and hearty out-door exercise on the part of many men who otherwise pursue sedentary lives, and because hunting by whatever means and to whatever extent involves large commercial dealings. We would not here include the market value of game, as the time is clearly close at hand when market hunting will be altogether a thing of the past; non-sale of game is the only justifiable course.

The Band-tailed Pigeon probably never did compare favorably in importance to the sportsman with quail or ducks. Its large size, and consequently greater food value, certainly gives it superiority over the dove as a game bird, though its numbers at best probably never approached those of the dove. The latter, too, was far more accessible.

The flesh of the pigeon is asserted by the majority of those who have eaten it to be delectable, favorably comparable with that of other game birds. In a few cases it is described as tough, though experience teaches that with any meat mode of cooking has chiefly to do with the results. One person (Bendire, 1892, p. 123) complains that in Oregon the flesh of pigeons shot at certain seasons was "bitter." This was thought to be due to the nature of the food locally. It is safe to say that no criticism of the pigeon as an article of food will receive general confirmation.

We have no statements from sportsmen of experience as to the rank of the pigeon as a bird worthy of skill in stalking and marksmanship. Volumes have been written with regard to quail, doves and ducks. The pigeon is doubtless, because of its totally different habits, in a class by itself. The writer has hunted pigeons to a small extent, and while confessedly not an acute sportsman, must admit that no other game bird, except jack snipe, has offered him so much of the hunter's exhilaration.

We have reason to believe that from every standpoint the pigeon deserves high consideration as a game bird of California. As has been clearly brought out this is the chief value of the bird to the interests of the state. Granted the last stated proposition, the next question to claim our attention is as to the means by which the pigeon may be brought to a point where it will be of greatest use as a game bird.

LEGISLATION RECOMMENDED

Up to the present moment not one whit of protection has been accorded the Band-tailed Pigeon in the State of California, save that in common with other game birds it has recently been declared a misdemeanor to destroy its eggs. At the same time there has been neither close season, nor bag limit, nor non-sale. It has thus been possible to slaughter pigeons at any season, and in any numbers, and to sell them without restriction in the open market!

This is exactly what occurred in the spring of 1912. To re-quote from Chambers (1912, p. 108): One hunter from Los Olivos, Santa Barbara County, shipped over 2,000 birds to San Francisco and Los Angeles hotels. The morning train from San Luis Obispo to Los Olivos on Sundays averaged 100 passengers who

came to hunt pigeons. A prominent sportsman stated that these passengers averaged about thirty birds apiece per day. This would make a single day's excursion account for over 3,000 pigeons. The pigeons "evidently hung around until they were simply shot out."

Is it not obvious that we have now allowed the unrestricted killing of pigeons until actual extermination is threatened? Is it not now too late for the enactment of *restrictive* measures to have any benefit in saving the pigeon as a game bird? Is not the only alternative demanded by the facts, an extended close period, so as to allow the pigeon to recover somewhat of its former strength?

When we consider the extraordinarily slow rate of reproduction of the Band-tailed Pigeon—as slow as that of the Black-tailed Deer which for more than a decade has been accorded a long annual close season and a bag limit of *two* in one year—in conjunction with the uncurbed slaughter to which the bird has been subjected, only one course appears to be open if we wish to re-establish the pigeon as an important game product of the state. It should be accorded at least *five years' total* protection. This would give it a chance to recover to a certain extent from the long period of unrestrained killing which it has up till now endured with the odds increasingly against it.

Only such a close season, put into effect at once, will save the Band-tailed Pigeon, *as a game bird*. Because of the probable permanence of our mountain fastnesses scattering representations of the species are likely to persist, in spite of continued persecution, for a few years to come. But if we are to count upon the Band-tailed Pigeon as an element of value in the game resources of the state, appropriate measures must be enforced to allow the re-growth of an adequate breeding-stock, and thereafter the annual toll by hunters must be restricted to a percentage inside of the birth-rate.

SUMMARY

The Band-tailed Pigeon has been reported in greater or less numbers from widely separated localities, from the Rocky Mountains to the Pacific, and from British Columbia to Mexico. Yet the evidence at hand leads to the belief that all those birds breeding within the Pacific Coast region from Vancouver Island south to the Mexican line, concentrate during the winter season in the valley and foothill sections of west-central and southern California. It becomes clearly apparent, therefore, that California holds the key to the future of the species as far as the Pacific slope is concerned.

Because the pigeon is broadly scattered throughout the forests and mountains of the whole Pacific district during the summer, it is not at that season particularly liable to decimation. But it is during the *winter*, when the birds are forced by uneven food supply into small areas in central and southern California, that there is a chance for almost unlimited destruction by hunters, such as occurred in the late winter of 1911-12.

In rate of increase, the Band-tailed Pigeon is by far the slowest of all our game birds. As a rule but one young is reared each year. Contrast this with ten among quail, eight among ducks, and four among wading birds. The impressive fact that our wild pigeon does not exceed, in rate of reproduction, the birth-rate of deer, antelope and elk, suggests the demand for treatment in game legislation to correspond with that given these large mammals.

Because of the dependence of the Band-tailed Pigeon upon wild fruits and nuts, and because of the varying crop of these from year to year, the winter distribution of the bird is practically never the same two years in succession. While

this irregularity in winter distribution frees the bird from the danger of continued pursuit in one locality, it on the other hand brings the entire pigeon population during recurring years into regions thickly populated by man, or at least of easy access to the hunter.

The chief or only value of the pigeon to man lies in its service as a game bird, and as such, it is pre-eminently worth cultivating. There is every reason to believe that the Band-tailed Pigeon is now represented by such very small numbers, as compared with its original abundance, that there are not enough birds even to warrant a restricted period of shooting annually. The thing which must be done, if we want the bird to figure at all in the future among our game birds, is to accord it a close period of at least five years. In this time its numbers should regain a stage where a subsequent annual open season would be warranted.

As it is, the Band-tailed Pigeon has been left practically without protection and subjected at times to unlimited slaughter, until the bird is now undoubtedly beyond effect by any measure except the close period here advocated. In fact, there is grave danger of total extinction, as in the case of the Passenger Pigeon of the east. And circumstances are very much the same as regards the attitude of man until too late.

Steps must be taken immediately to give the Band-tailed Pigeon that degree of protection which will insure its permanent existence as a game asset of the future.

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FROM FIELD AND STUDY

Another Instance of Cannibalism in the Spotted Owl.—The Spotted Owl, *Strix occidentalis* (Xantus), is a rather rare bird in this section of California, judging from the number of skins in southern California collections. Lucky is he who, after a dozen years' work in the field, can place more than one specimen to his credit. For this reason I wish to record one shot by R. D. Jewett in Pacoima Canyon, above the junction with Maple Canyon, back of San Fernando, California.

A pair had been heard the night before, and campers had fired several shots in the direction of the sounds, evidently with results, for on the following night only one bird was in